Navigating Global and Local Semiconductor Material Markets and Supply Chain

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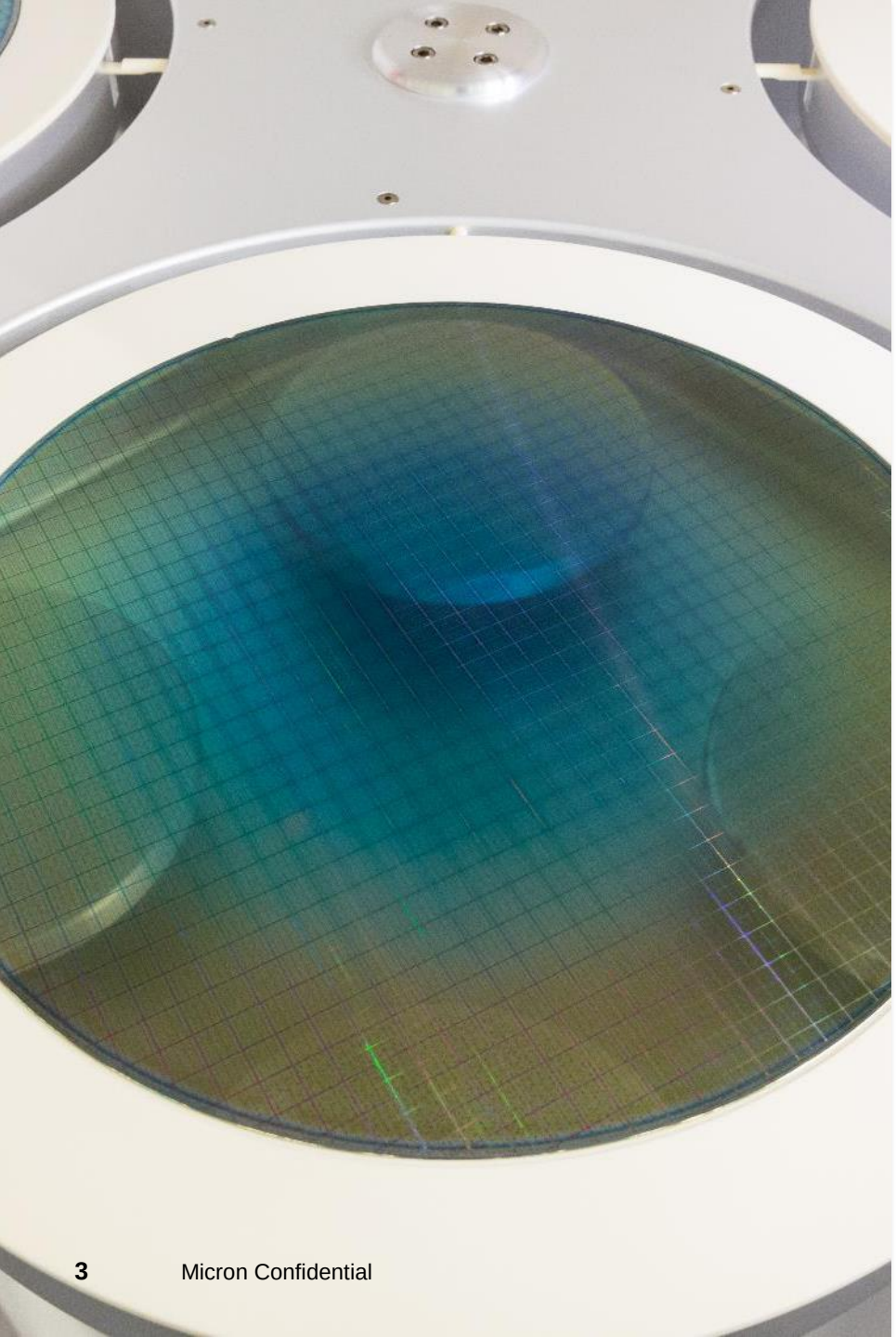
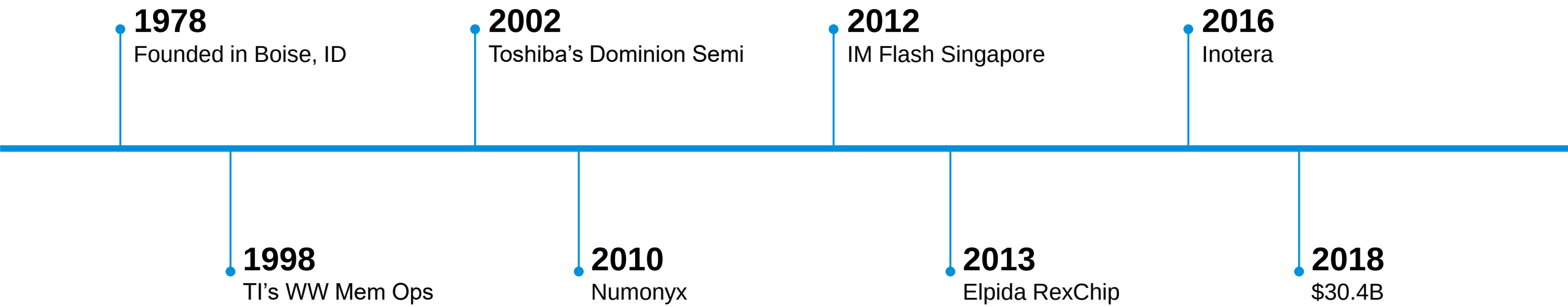


Agenda

- Micron Introduction
- Global & Local Semiconductor Material Market
- Criticality in Material Quality
- Weakness in Material Industry
- Chemical Contamination Control & Detection System
- Micron Case Study
- Summary

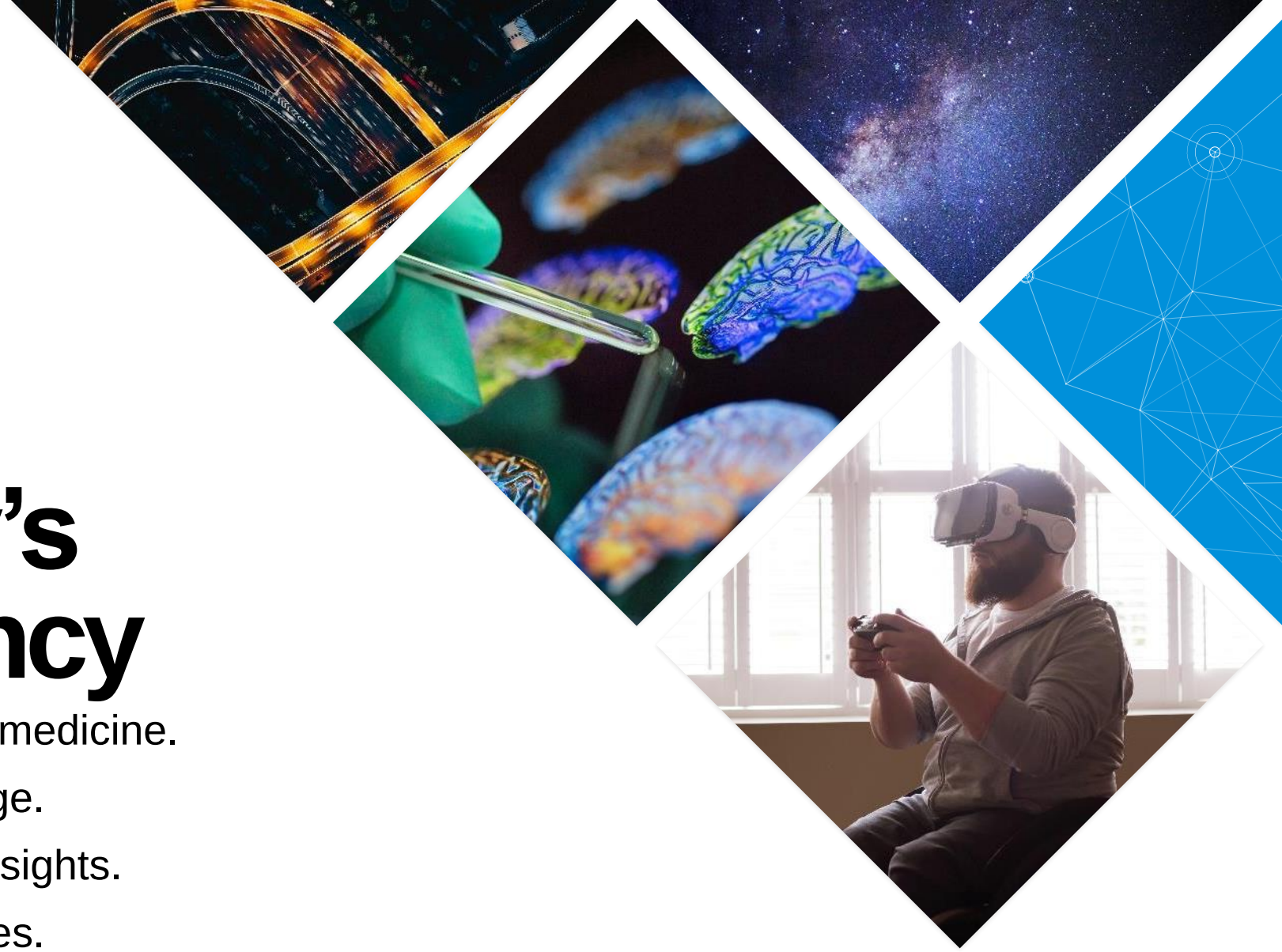
40 Year Legacy



Leading Technology Innovation	Expanding Trusting Partnerships	Scaling Manufacturing & Global Footprint

Global Scale and Manufacturing Excellence

We deliver comprehensive customer collaboration, support, and quality throughout the product lifecycle and around the world.



Data Is Today's Global Currency

Sparking discovery in science and medicine.

Driving more intelligence at the edge.

Accelerating the speed of critical insights.

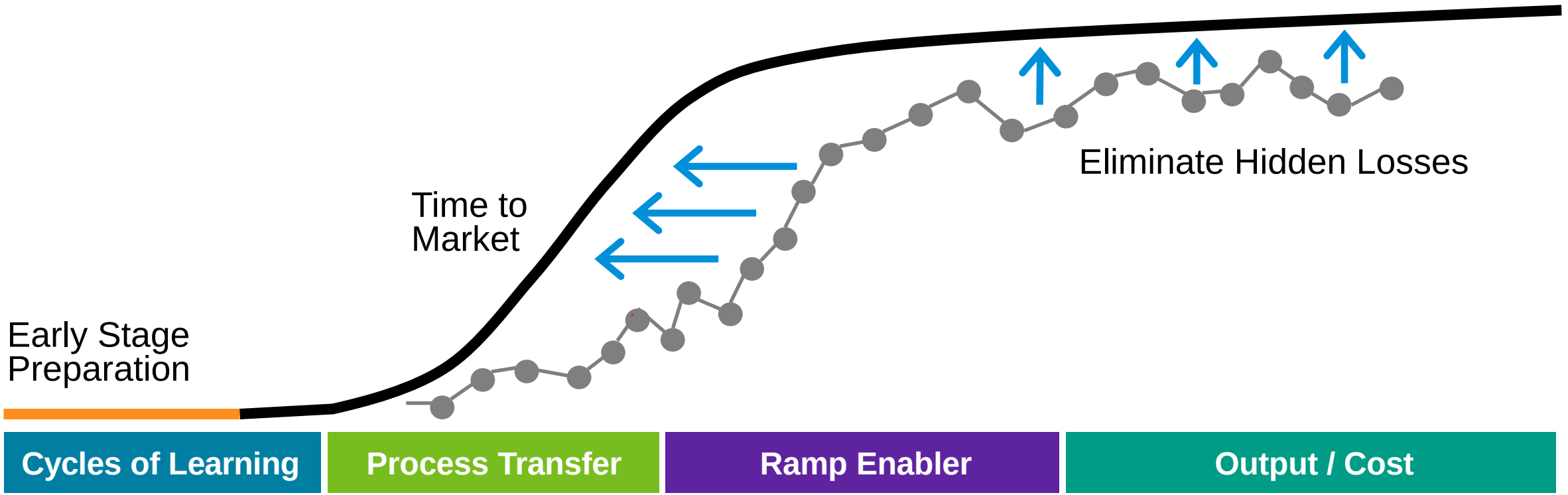
Inspiring new consumer experiences.

Technology Scaling Challenges

	DRAM	NAND
Application	Pitch multiplication processes enable feature scaling but challenge fab space and cycle time	CVD / ETCH process progression is challenging space, capital depreciation & cycle time
Action	Materials and process innovation to enable scaling	Disruptive equipment capability that enables linear scaling

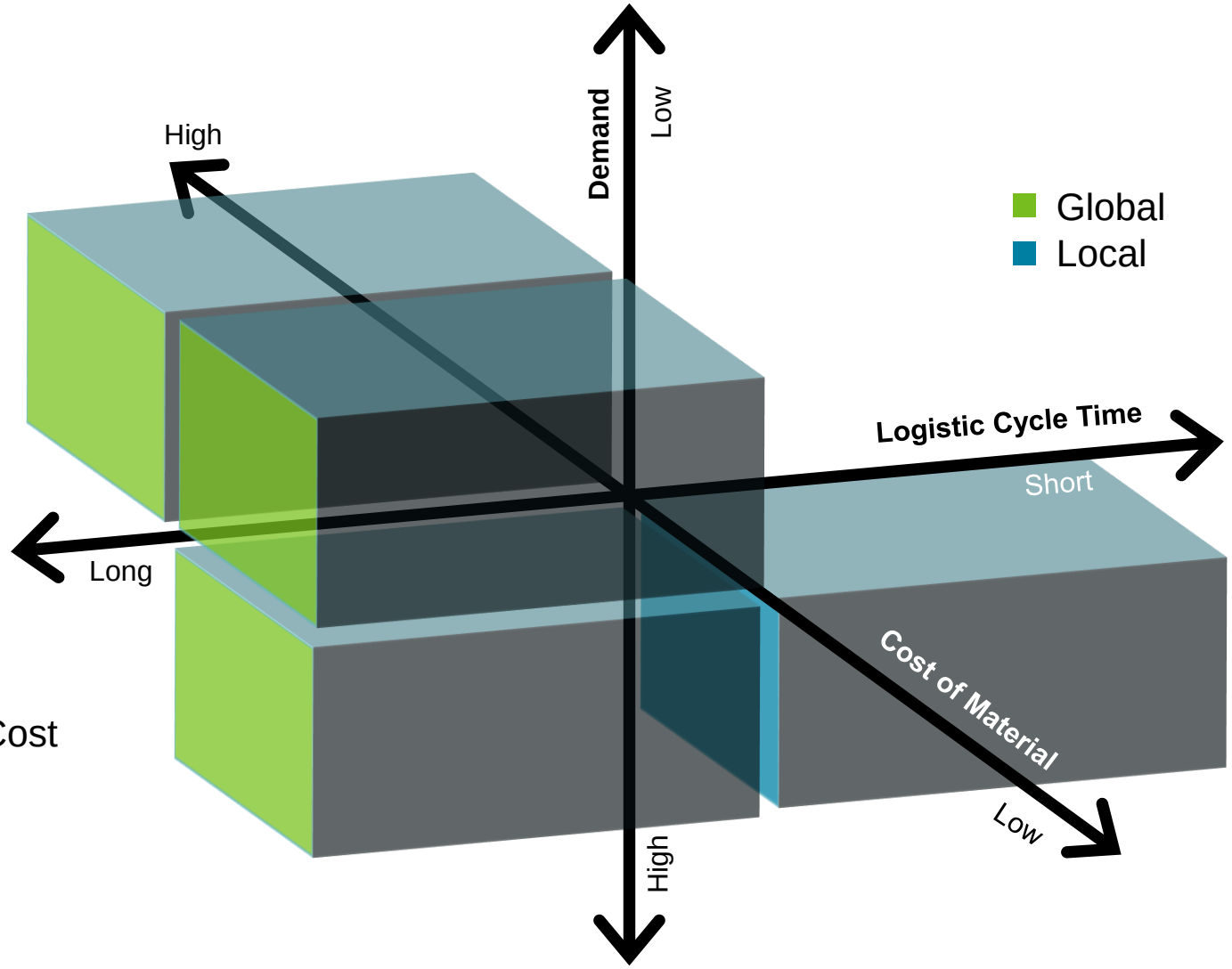
Accelerating End-to-End Solutions

Fab Manufacturing Engagement With Materials Suppliers



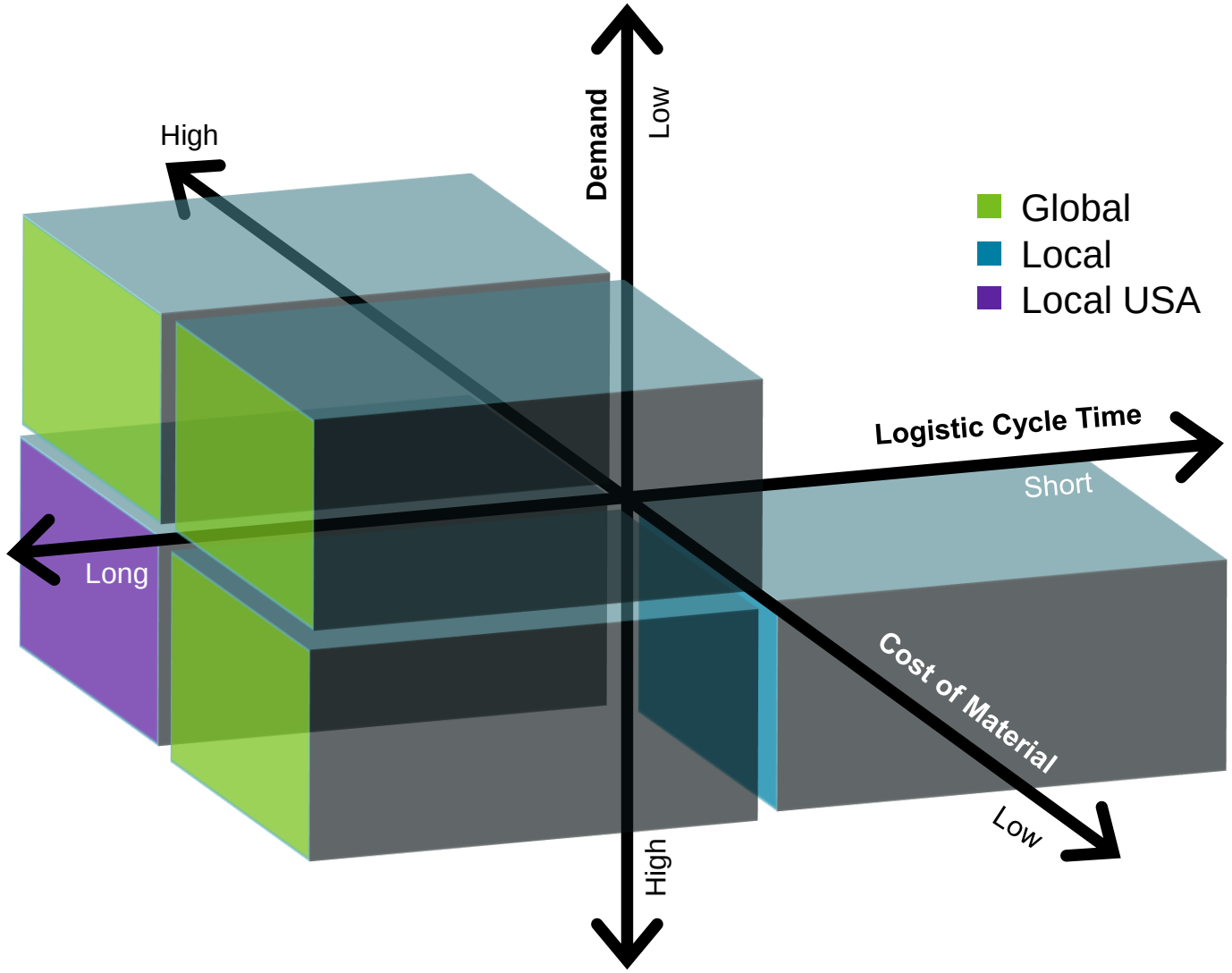
Global vs Local Semiconductor Material Market (Conventional)

- Most regional source can meet quality need
- **Local Supply** = High Demand + Low CT + Low Cost



Global vs Local Semiconductor Material Market (Quality Driven)

- North America source = quality limitation in varying sources
- Sourcing extend beyond North America to global
- **Better quality = win business**



Quality of Material is the New Game Changer to Win in Material Business in Local or Global Market

Driven by Technology Advancement in Process & OEM Capability Improvement

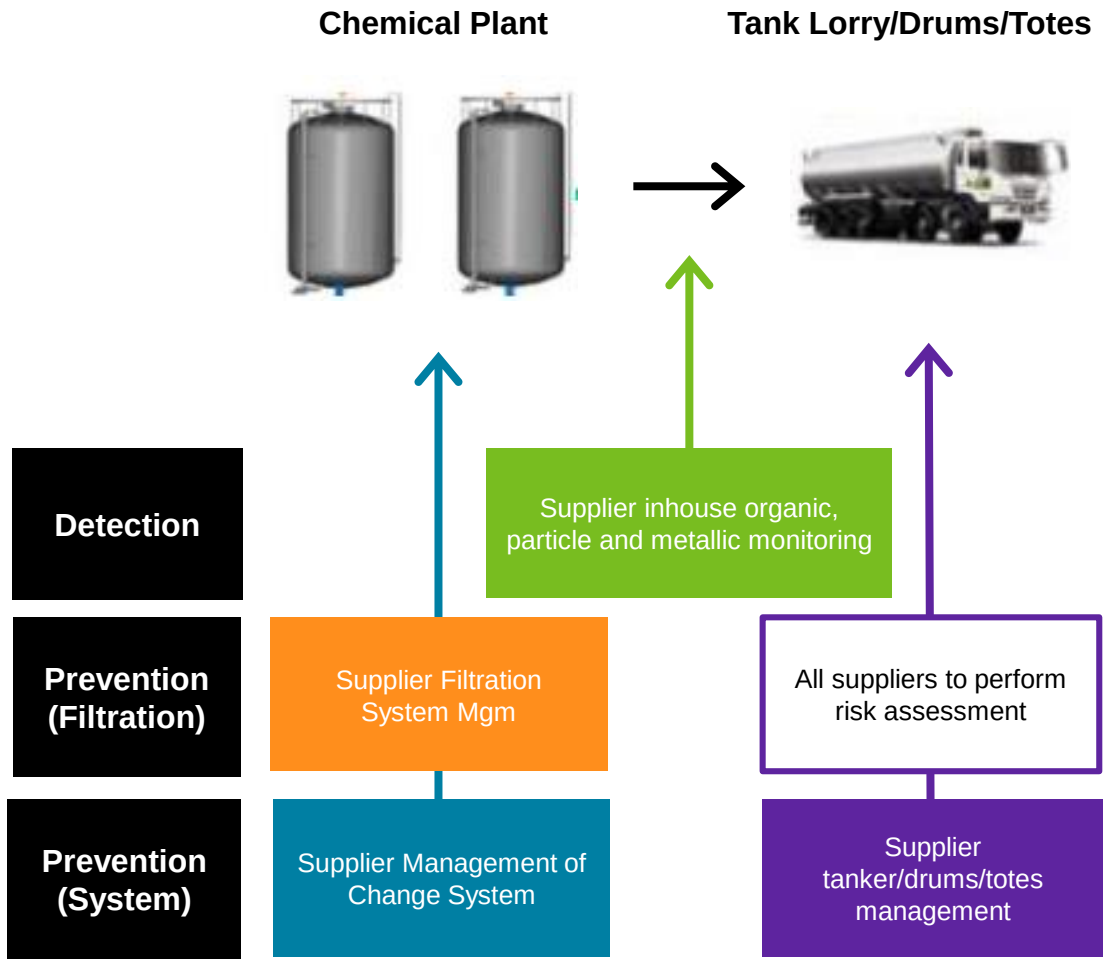
Weakness in Material Supply Industry

Weakness in Material Supply Industry

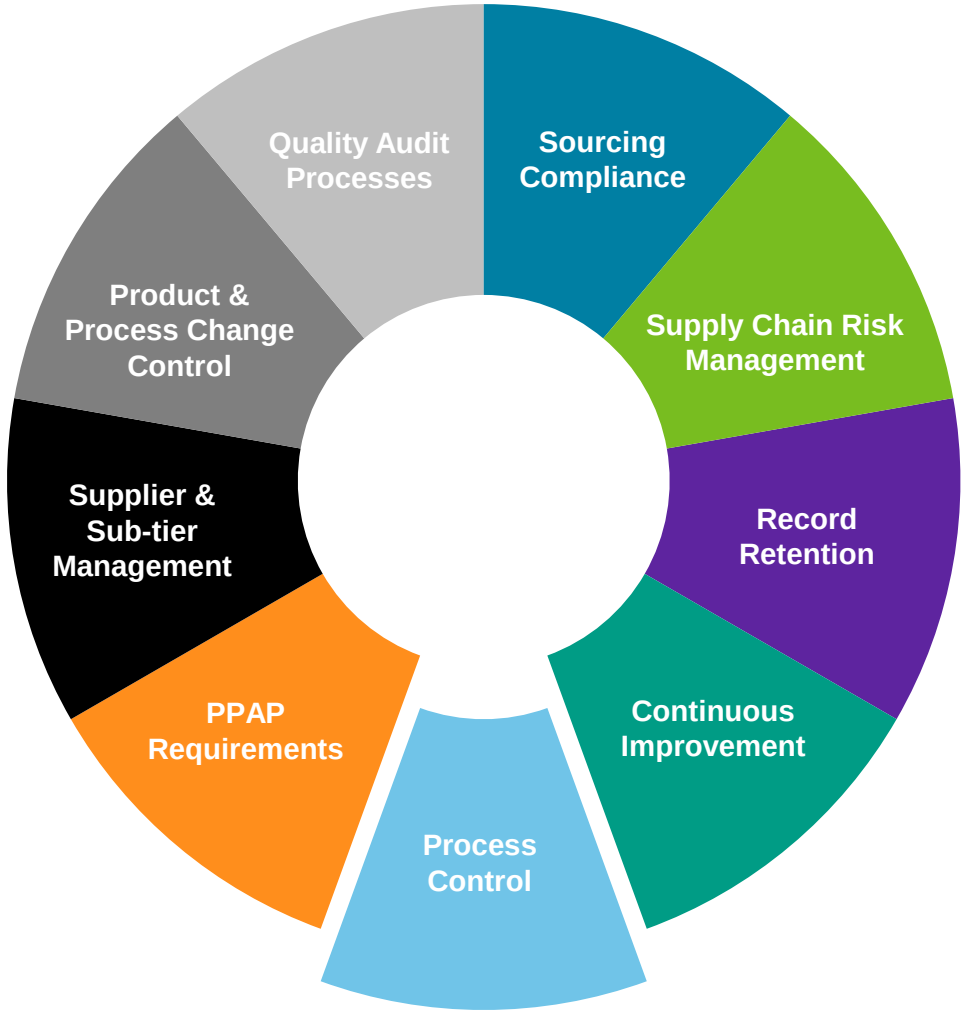
	Risk Assessment	Detection Capability
Task	▪ RA Tools lacking in some Material suppliers ▪ Example: FMEA tie to Control Plan ▪ Include packaging, valves & connectors PM Management	▪ Organic, Metallic, Particle contamination are the challenge in industry ▪ Organic analysis is most immature ▪ Online Organic analytical system & Filtration not readily available ▪ 3rd Party Electronic Specialty Gas analytical capability not readily available in industry
Action	▪ Supplier to control Manufacturing Process through Control Plans driven by FMEA. ▪ Supplier to take action when drift in baseline process alerted Ship to Control OOC.	▪ Supplier to enhance Control Point Hardening in upstream raw material supplier. ▪ Supplier to upgrade Metrology Capability especially Organic, Metallic & Particles detection.

Chemical Contamination Control and Detection System

Shift Left
Early Detection
QMS



Case Study North America Region



Bulk Chemicals Incoming Quality

Issue: Organic Contamination in NH4OH due to Inability to detect organics and no Organic specs for incoming chemicals

Source: UPW system bacteria contamination

- Failure in SPC disposition when filter pressure OOC
- Failure to detect at Outgoing CoA & Inline Scan

Remedy:

- Supplier specs to include organics
- Enable organic analysis capability

Supplier Impact: Loss of business

Case Study Asia Region

Bulk Chemicals Incoming Quality and Change Control

Issue:

- Particle Contamination in IPA resulting Probe yield fallout during a conversion to different source Iso-tanker

Source:

- Improper management on contaminated Iso-tanker connection hose coupler/cap

Remedy:

- Supplier to implement proper procedure for hose/ coupler/cap washing after use.

Supplier Impact: Reduced business share

Summary

Navigating Global and Local Semiconductor Material Markets and Supply Chain

Advance technology nodes driving a paradigm shift on current process controls.

Early detection capability is key to protect the customers enabling zero excursion.

QMS towards IATF compliance with key critical systems.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